

Mark Marley,
NASA Ames Research Center
MS 245-3
mark.s.marley@nasa.gov

Giant Planets in Reflected Light: What Science can we expect?

Interpreting the reflection spectra of cool giant planets will be a challenge. Spectra of such worlds are expected to be primarily shaped by scattering from clouds and hazes and punctuated by absorption bands of methane, water, and ammonia. While the warmest giants may be cloudless, their atmospheres will almost certainly sport substantial photochemical hazes. Furthermore the masses of most direct imaging targets will be constrained by radial velocity observations, their radii, and thus atmospheric gravity, will be imperfectly known. The uncertainty in planet radius and gravity will compound with uncertain aerosol properties to make estimation of key absorber abundances difficult. To address such concerns our group is developing atmospheric retrieval tools to constrain quantities of interest, particular gas mixing ratios. We have applied our Markov Chain Monte Carlo methods to simulated data of the quality expected from the WFIRST CGI instrument and found that given sufficiently high SNR data we can confidently identify and constrain the abundance of methane, cloud top pressures, gravity, and the star-planet-observer phase angle. In my presentation I will explain the expected characteristics of cool extrasolar giant planet reflection spectra, discuss these and other challenges in their interpretation, and summarize the science results we can expect from direct imaging observations.